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HEALTH AND SAFETY PLAN

ENVIRONMENTAL RESTORATION PROGRAM

Rocky Flats Plant



Rockwell International
Aerospace Operations
Rocky Flats Plant
Golden, Colorado

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1. INTRODUCTION

Multi-media monitoring activities at Rocky Flats Plant are part of the Department of Energy's (DOE) Environmental Restoration (ER) Program [formerly called the Comprehensive Environmental Assessment and Response Program (CEARP)]. This Health and Safety Plan is one component of the monitoring plans for Rocky Flats Plant. The monitoring plans consist of five parts: Sampling Plan, Technical Data Management Plan, Health and Safety Plan, Quality Assurance/Quality Control Plan, and Standard Operating Procedures.

This Health and Safety Plan incorporates the specific safety practices and procedural review requirements for Rocky Flats Plant and includes the requirements of DOE as specified in DOE Orders. It has been written at a site-specific level, and covers background characterization and monitoring, RCRA ground-water monitoring, and CERCLA remedial investigations. The Plan includes justifications for personnel protection requirements proposed at each area (Section 4).

2. POLICY AND STANDARDS

It is DOE's policy that its operations shall be conducted in a manner that will (1) limit risks to the health and safety of the public and employees, and (2) adequately protect property and the environment. DOE has responsibility for health, safety, and environmental protection programs at DOE-owned contractor-operated facilities. Consistent with this responsibility, this Health and Safety Plan includes the current health and safety policy and standards in effect at Rocky Flats Plant. It also includes provisions to implement external subcontractor policy and standards when the latter are determined to be more restrictive.

2.1. POLICY

The main tenet of this Health and Safety plan is to keep human exposure to toxic materials and radiation at levels as low as reasonably achievable (ALARA). Specific ALARA procedures will include engineering controls, administrative controls, and the use of personal protective equipment. The length of time employees spend in areas with elevated levels of radioactive or toxic materials will be minimized. If conditions produce airborne contaminants, dust suppressant measures will be taken.

2.2. STANDARDS AND REGULATIONS

The environmental, safety, and health protection requirements applicable to Rocky Flats Plant operations are set forth in DOE and DOE-Albuquerque Operations Office Orders. These orders require compliance with applicable federal, State of Colorado, and local standards. This Rocky Flats Plant Health and Safety Plan is based on these DOE Orders, federal regulations, and other professional judgment.

2.3 PLANT PERMITS AND SUPPORTIVE DEPARTMENTS

Various permits are required at the Rocky Flats Plant in order to properly control activities and personnel within the Plant. The permits are administered through different Plant departments. Construction Management distributes land use and work activity permits (e.g., work, welding, excavation, samples, and entry) for approvals. Plant Protection must be contacted for firing range access permits, escorts, and justification for entry into secured areas.

The Construction Coordinator appointed by Construction Management is responsible for coordinating with the various departments for permits, escorts, justifications for entries, and supportive functions, e.g. laundry, waste operations, when notified by the ER Program Manager, ER Program Field Supervisor, or Subcontractor Site Manager.

3. HEALTH AND SAFETY RESPONSIBILITIES

The organizations conducting ER Program site activities and the Health, Safety, and Environment Department are responsible for health and safety of employees and the public. The organizational chart for health and safety at Rocky Flats Plant is presented in Figure 3.1.

3.1 GENERAL RESPONSIBILITIES

The Rockwell Health, Safety, and Environment (HSE) Department and the Subcontractor Site Managers are responsible for ensuring the health and safety of field team personnel. The HSE Area Safety Engineer and the Subcontractor Site Health and Safety Coordinator provide guidance to the ER Program Field Supervisor and Subcontractor Project and Site Managers regarding potential health hazards during characterization activities. The HSE Area Safety Engineer and Subcontractor Site Health and Safety Coordinator have the authority to terminate field activities at specific sites if unsafe conditions develop. Field activities will recommence only after the ER Program Manager authorizes such a restart.

3.2 INSTALLATION RESPONSIBILITIES

The Rockwell Director of Health, Safety, and Environment has primary responsibility for specifying and implementing health and safety requirements at Rocky Flats Plant. The HSE Area Safety Engineer, along with other representatives of the Rockwell International Health, Safety, and Environment Department, under direction of the Rockwell International HSE Director, will provide guidance to the

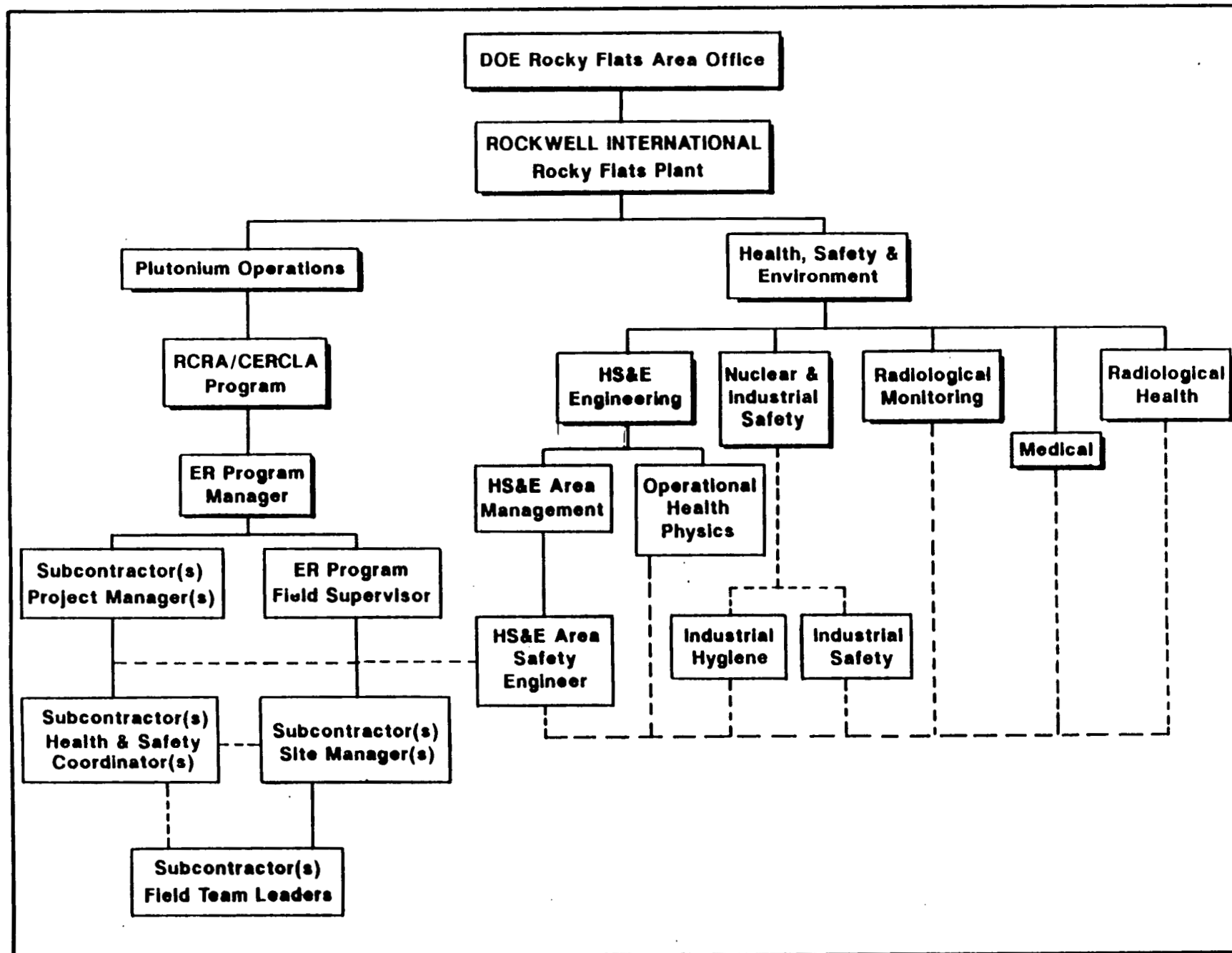


Figure 3-1:
HEALTH & SAFETY ORGANIZATIONAL CHART FOR ROCKY FLATS PLANT

ER Program Field Supervisor and the Subcontractor Site Health and Safety Coordinator for establishing health and safety requirements in accordance with the current health and safety policy and standards in effect at Rocky Flats Plant.

3.3. SPECIFIC RESPONSIBILITIES

3.3.1 Rockwell International ER Program Manager

The ER Program Manager shall:

- ensure that the Rocky Flats Plant ER Program Health and Safety Plans are prepared, reviewed, and concurred with by the appropriate individuals within DOE-Albuquerque Operations Office and Rocky Flats Plant;
- approve the selection of the Subcontractor Site Manager and Subcontractor Site Health and Safety Coordinator;
- require periodic health and safety audits (at least once during each stage of sampling), review Health and Safety Audit Reports, and require responses to Health and Safety Audit Report findings and recommendations;
- act on employee concerns in accordance with the procedures outlined in DOE Orders and take appropriate action to correct violations;
- review and evaluate requests for variance from the Health and Safety plans; and
- ensure that the proper reports required by DOE and DOE-Albuquerque Operations Office orders are submitted, including accident investigation reports, as necessary.

3.3.2 Rockwell International ER Program Field Supervisor

The ER Program Field Supervisor shall:

- coordinate with Area Safety Engineer to ensure Subcontractor Project Manager, Site Manager, and Health and Safety Coordinator fulfill their responsibilities;
- review and evaluate variance requests to the Health and Safety Plan;
- be familiar with emergency response procedures and notification requirements, and assist in their implementation if required; and
- ensure recommendations from the Area Safety Engineer are fulfilled.

3.3.3 Rockwell International HSE Area Safety Engineer

The HSE Area Safety Engineer shall:

- coordinate with all necessary internal Rocky Flats department representatives to ensure the implementation of the Health and Safety Plans;
- monitor to ensure that personnel involved with ER Program site activities comply with the Health and Safety Plans;
- conduct periodic Health and Safety Audits, make recommendations, and assure implementation of those recommendations;
- review and evaluate variance requests to the Health and Safety Plans;
- ensure that Industrial Hygiene, Operational Health Physics, and Radiological Health conduct sampling, analysis, and data reduction for toxic and radioactive materials and exposure assessments;
- ensure that Industrial Hygiene and Operational Health Physics establish and verify work safety procedures dealing with toxic and radioactive substances;
- verify that health and safety equipment is calibrated, maintained, and operated in accordance with manufacturers' specifications and recommendations; and
- coordinate the review and revision processes for Site Specific Health and Safety Plans, Job Safety Analyses (JSA), and Operational Safety Analyses (OSA).

3.3.4 Subcontractor Project Manager(s)

The Subcontractor Project Manager(s) shall:

- assign a Subcontractor Site Manager(s) (Section 3.3.5) who will be responsible for ensuring the health and safety of field team personnel;
- assign a Subcontractor Site Health and Safety Coordinator(s) (Section 3.3.6) to ensure implementation of the Health and Safety Plans;
- read, concur, and comply with the Health and Safety Plans; and
- review and disapprove or approve and submit requests for variance from the requirements of this plan to the ER Program Manager and Field Supervisor.

3.3.5 Subcontractor Site Manager(s)

The Subcontractor Site Manager(s) shall:

- assure that requirements specified in DOE and DOE-Albuquerque Operations Office Orders 5484.1 are recorded and reported for all employees;
- ensure that personnel involved with the ER Program comply with the Health and Safety Plans;
- monitor the performance of employees involved in field activities to ensure compliance with health and safety requirements;
- be familiar with emergency response procedures and notification requirements, and implement them accordingly; and
- terminate work activities if unsafe conditions develop or when directed to do so by the Subcontractor Site Health and Safety Coordinator, Subcontractor Project Manager, HSE Area Safety Engineer, ER Program Manager or Field Supervisor, or Rockwell Security Officer.

3.3.6 Subcontractor Site Health and Safety Coordinator(s)

A Subcontractor Site Health and Safety Coordinator(s) will be designated by the Subcontractor Project Manager(s) for each stage of activities. The Rockwell International ER Program Manager shall concur in the selection of the Subcontractor Site Health and Safety Coordinator(s). The Subcontractor Site Health and Safety Coordinator(s) is responsible for conducting a review of the proposed activities prior to commencement of operations, evaluating potential hazards, and recording the appropriate information on a Work Location, Personnel Protection, and Safety Evaluation Form (Appendix A). Activities that require special monitoring or certain personal protective equipment will be specified in the Health and Safety Plans. Specific responsibilities of the Subcontractor Site Health and Safety Coordinator(s) include the following:

- Monitoring hazards to determine the degree of hazard present.
- Implementing the personnel protection requirements specified in the Health and Safety Plan, including ensuring that appropriate clothing and equipment are used.
- Maintaining an inventory and storage of health and safety equipment.
- Evaluating weather, chemical and/or radiation hazards and physical hazards to recommend modifications to work plans and personnel protection levels needed to maintain personnel safety.
- Monitoring the performance of all personnel to ensure that the required safety and decontamination procedures are followed.

- Notifying emergency authorities as appropriate.
- Ensuring that all ER Program personnel have been trained for any non-routine site activities.
- Ensuring that all subcontractor personnel have been trained in proper site safety procedures, including the use of personal protective equipment.
- Being present or having an acceptable alternate present when subcontractor work activities are being performed in areas requiring decontamination of personnel or equipment.
- Advising the Rockwell International ER Program Manager, the ER Program Field Supervisor, the HSE Area Safety Engineer, and the Subcontractor Site Manager of potential health and safety hazards during field activities.
- Conduct special monitoring, if necessary.
- Evaluate potential modifications to work plans and personal protective equipment requirements to ensure employee safety.
- Ensure that field team members have been trained in the appropriate safety procedures for the activities they will conduct, have current medical certification that they are physically fit to perform required tasks, and have participated in all required dosimetry or bioassay training programs.
- Contact the Rocky Flats Plant emergency organization/Plant Protection (or telephone 911) to coordinate emergency response activities.
- Require that the Subcontractor Field Team Leader terminate work activities if unsafe conditions develop, or an imminent hazard is perceived.
- Prepare variances from the health and safety requirements if needed, and submit them to the Subcontractor Project Manager for approval.
- Acquire, calibrate, and prepare radiation and air monitoring instruments used by subcontractor personnel.

3.4. AUDITS

Health and safety audits will be conducted by the HSE Area Safety Engineer and the Subcontractor(s) Health and Safety Department. The ER Program Manager and Field Supervisor, and the Subcontractor Project Manager, Subcontractor Site Manager, and Subcontractor Health and Safety Coordinator will receive copies of these audits.

The Rockwell International Health, Safety, and Environment Department may conduct health and safety audits, separately or concurrently, with the subcontractor's corporate health and safety audits to ensure compliance with this Health and Safety Plan.

3.5. VARIANCES FROM HEALTH AND SAFETY REQUIREMENTS

Where special conditions exist, a written request for a variance from a specific health and safety requirement may be submitted by the Subcontractor Site Health and Safety Coordinator to the Subcontractor Project Manager. If the Subcontractor Project Manager agrees with the request, the request will be forwarded to the ER Program Field Supervisor, then the HSE Area Safety Engineer, followed by a review by the ER Program Manager. The conditions of the request will be evaluated and, if appropriate, a variance specifying the conditions under which the requirements may be modified will be granted in writing by the ER Program Manager. A copy of the variance will be retained in the field during work activities in which it is invoked.

For timely implementation of variances during field activities, a verbal variance request may be made by the Subcontractor Site Manager through the Subcontractor Site Health and Safety Coordinator to the ER Program Field Supervisor and HSE Area Safety Engineer. All such verbal requests for variance will be submitted in written form by the Subcontractor Site Health and Safety Coordinator to the HSE Area Safety Engineer and ER Program Field Supervisor and Manager within five working days following the verbal request.

4. HAZARD ASSESSMENT AND PERSONNEL PROTECTION REQUIREMENTS

The following section provides a description of anticipated site-specific hazards at Rocky Flats Plant.

4.1. IDENTIFICATION OF POTENTIAL HAZARDS

The following section provides a description of anticipated potential hazards at the Rocky Flats Plant. The hazards description includes physical, chemical, radiological, and biological hazards, followed by general requirements for limiting exposures, monitoring contaminant concentrations, and measuring employee exposure.

4.1.1 General Hazards

Physical Hazards

The following physical hazards are anticipated at Rocky Flats Plant.

Heat Stress

The body's physiological processes fail to maintain a normal body temperature because of excessive heat. A number of physical reactions can occur, ranging from mild to fatal.

Heat-Related Problems

- Heat Rash, caused by continuous exposure to heat and humid air aggravated by chafing clothes. Decreases ability to tolerate heat and becomes a nuisance.
- Heat Cramps, caused by profuse perspiration with inadequate fluid intake and chemical replacements (especially salts). Signs: muscle spasm and pain in the extremities and abdomen.

- Heat Exhaustion, caused by increased stress on various organs to meet increased demands to cool the body. Signs: shallow breathing; pale, cool, moist skin; profuse sweating; dizziness and lassitude.
- Heat Stroke, the most severe form of heat stress. Body must be cooled immediately to prevent severe injury and/or death. Signs: red, hot, dry skin; no perspiration; nausea; dizziness and confusion; strong, rapid pulse; coma.

Work/Rest Schedule

When working in Level B or C protective clothing, the following guideline for calculating the work/rest schedule shall be used.

Calculate the adjusted temperature.

$$T(\text{adjusted}) = T(\text{actual}) + (13 \times \text{sunshine fraction})$$

100% sunshine =	no cloud cover	=1.0
50% sunshine =	50% cloud cover	=0.5
0% sunshine =	full cloud cover	=0.0

Adjusted Temperature	Active Work Time (min/hr)
75 or less	50
80	40
85	30
90	20
95	10
100	0

Cold Exposure

Persons working outdoors in temperatures at or below freezing can become frostbitten. Exposure to extreme cold for short time periods can cause severe injury to the body surface or can result in profound generalized cooling, causing death. Body areas which have high surface-area-to-volume ratios (e.g., fingers, toes, and ears) are the most susceptible.

Cold Exposure-Related Problems

- Frost nip or incipient frostbite, characterized by sudden blanching or whitening of skin.
- Superficial frostbite, which causes skin to become waxy or white and superficially firm, but resilient beneath.
- Deep frostbite, characterized by cold, pale, solid skin tissues.

- Systematic hypothermia, caused by exposure to freezing or rapidly dropping temperature. Symptoms are usually exhibited in five stages: 1) shivering; 2) apathy, listlessness, sleepiness and (sometimes) rapid cooling of the body to less than 95°F; 3) unconsciousness, glassy stare, slow pulse, and slow respiratory rate; 4) freezing of the extremities; and finally 5) death.

Caution will be used to prevent cold exposure by wearing properly insulated garments beneath protective clothing and by taking frequent warm-up breaks.

Noise

When noise exceeds acceptable levels (limits specified in Department of Air Force Regulation 161-35 TLVs) administrative or engineering controls designed to reduce exposures will be utilized. If these controls are not sufficient, approved ear protection will be provided and its use mandated. Noise levels will be monitored when it becomes necessary to speak loudly under normal working conditions.

Standard Precautions for Equipment and Structures

Field activities at Rocky Flats Plant may require the use of shovels, drill rigs, portable augers, and backhoes. Prior to any surface disturbance the required permit will be obtained from Rocky Flats Plant. Heavy equipment will be operated according to OSHA recommendations and requirements.

- Only qualified and licensed personnel shall be allowed to operate this equipment.
- Heavy equipment shall be operated and maintained in conformance with established standards and inspected prior to use, as directed by Federal, State, or OSHA regulations.
- Overhead electrical power lines shall be considered energized unless Rocky Flats Plant Utilities Manager has verified de-energization.
- While in use, drilling rigs shall maintain the following minimum distances from overhead power lines: 10 ft for 50 kv, 20 ft for 345 kv, and 34 ft for 750 kv.
- In transit, with the boom or derrick lowered, the closest approach to a power line shall be 4 ft for 50 kv, 10 ft for 50-345 kv, and 16 ft for 345-750 kv.

Flammable and/or Combustible Materials

Several sites requiring characterization could contain flammable or combustible materials. The Health and Safety Plans will contain detailed information on the likelihood of encountering combustible materials and specific health and safety requirements for these areas.

Biological Hazards

Certain biological hazards are anticipated at Rocky Flats Plant:

- insects, including ticks and mosquitoes;
- snakes of poisonous and nonpoisonous species; and
- rodents, including mice and rats.

If a worker is bitten by a rodent or snake, the Subcontractor Site Health and Safety Coordinator will be immediately notified. The Rocky Flats Plant installation medical center shall be contacted and appropriate medical care given.

4.1.2 Site Specific

Specific chemical and radiological contaminants at sites to be investigated are discussed in the following sections and are presented in Appendix A. These site-specific discussions are based on data presented in the Rocky Flats Plant RCRA Part B Operating Permit Application (DOE 1988a). If additional hazards are found during field activities, this health and safety plan will be amended as appropriate.

Personnel air sampling for organic compounds was conducted in 1987 during ground-water well installation and borehole soil sampling. Carbon adsorption tubes were used initially and later 3M organic vapor monitors were worn.

Contaminants of concern, based on drilling location, were carbon tetrachloride (TLV = 5 ppm), trichloroethane (TLV = 350 ppm), trichloroethylene (TLV = 50 ppm), and perchloroethylene (tetrachloroethylene) (TLV = 50 ppm). Table 1 lists the results of the air

monitoring program by drilling location number. Values indicated as "less than" are below the detection limit. A zero value indicates no analysis was performed for that compound. All values are well below the TLV for the contaminant.

4.1.2.1 Background Areas

The background drilling locations were chosen in areas unaffected by waste management units. Therefore, no contaminants are expected to be encountered during the drilling of background wells.

4.1.2.2 881 Hillside Area

The principal chemical contaminants of concern in the vicinity of the 881 Hillside Area are chlorinated hydrocarbons (tetrachloroethylene, trichloroethylene, 1,1,1-trichloroethane and 1,1-dichloroethylene) (Rockwell International, 1988). The highest measured concentrations of these compounds in groundwater were reported during 1987 in well 9-74. These highest measured values were 13,200 (ppb) of tetrachloroethylene, 72,000 ppb of trichloroethylene, 30,250 ppb of 1,1,1-trichloroethane and 48,000 ppb of 1,1-dichloroethylene. Lower concentrations of these compounds were detected in previous and subsequent sampling events (Rockwell

AIR MONITORING RESULTS
GROUNDWATER WELL AND BOREHOLE
DRILLING SUMMER 1987
ROCKY FLATS PLANT

DATE	DRILLING LOCATION	(ppm)			
		PERCHLORO-ETHYLENE	TRICHLORO-ETHYLENE	CARBON TETRACHLORIDE	TRICHLORO-ETHANE
09/21/87	5487BH	<0.030	0.000	0.000	<0.040
09/22/87	3287BR	<0.008	0.000	0.000	<0.010
09/22/87	5187BH	<0.040	0.000	0.000	<0.050
09/22/87	5287BH	<0.080	0.000	0.000	<0.100
09/23/87	2687	<0.060	0.000	0.000	<0.070
09/23/87	3187BR	<0.020	0.000	0.000	<0.020
09/23/87	3287BR	<0.080	0.000	0.000	<0.090
09/24/87	2687	<0.060	0.000	0.000	<0.080
09/24/87	3187BR	<0.060	0.000	0.000	<0.070
09/24/87	3287BR	<0.010	0.000	0.000	<0.020
09/25/87	3187BR	<0.050	0.000	0.000	<0.060
09/29/87	2987	<0.070	0.000	0.000	<0.090
09/29/87	3087BR	<0.020	0.000	0.000	<0.020
09/30/87	2287BR	<0.060	<0.200	<0.300	<0.070
09/30/87	2987	<0.070	0.000	0.000	<0.080
09/30/87	3087BR	<0.020	0.000	0.000	<0.020
09/30/87	4787	<0.200	<0.300	<0.700	<0.200
10/01/87	2287BR	<0.030	<0.080	<0.200	<0.040
10/01/87	4787	<0.080	<0.200	<0.400	<0.100
10/01/87	4987	<0.100	<0.300	<0.600	<0.200
10/02/87	2287BR	<0.050	<0.200	<0.300	<0.060
10/02/87	4887	<0.200	<0.500	<2.000	<0.300
10/02/87	4987	<0.070	<0.200	<0.400	<0.090
10/02/87	5087	<0.030	<0.070	<0.200	<0.030
10/16/87	4587BR	<0.139	<0.168	<0.140	0.000
10/16/87	5287	<0.110	<0.133	<0.111	0.000
10/20/87	5287BH	<0.117	<0.142	<0.119	0.000
10/21/87	SP0387	<0.130	<0.157	<0.131	0.000
10/05/87	2287BR	<0.117	<0.142	0.000	0.000
10/05/87	2287BR	<0.120	<0.140	<0.145	0.000
10/17/87	2287BR	<0.118	<0.144	<0.120	0.000
10/05/87	4587BR	<0.222	<0.269	0.000	<0.259
10/13/87	5387	<0.108	<0.131	<0.109	0.000
10/15/87	4587BR	<0.105	<0.127	<0.106	0.000
10/13/87	6187BH	<0.111	<0.135	<0.113	0.000
10/29/87	SP0887	<0.116	<0.140	<0.117	0.000
10/30/87	SP0887	<0.097	<0.118	<0.098	0.000
10/05/87	4887	<0.165	<0.192	<0.165	0.000
10/13/87	2287BR	<0.097	<0.118	<0.098	0.000
10/15/87	2287BR	<0.103	<0.125	<0.104	0.000
10/30/87	SP0287	<0.100	<0.121	<0.101	0.000
10/06/87	2287BR	<0.120	<0.146	<0.122	0.000
10/06/87	5987BH	<0.115	<0.140	<0.117	0.000
10/13/87	2287BR	<0.097	<0.118	<0.098	0.000
10/15/87	5587BR	<0.261	<0.316	<0.264	0.000
10/07/87	4587BR	<0.125	<0.151	<0.126	0.000
10/08/87	2287BR	<0.105	<0.173	<0.145	0.000

AIR MONITORING RESULTS
GROUNDWATER WELL AND BOREHOLE
DRILLING SUMMER 1987
ROCKY FLATS PLANT

DATE	DRILLING LOCATION	PERCHLORO-ETHYLENE	TRICHLORO-ETHYLENE	CARBON TETRACHLORIDE	TRICHLORO-ETHANE
10/08/87	4387	<0.114	<0.138	<0.115	0.000
10/28/87	SP0187	<0.106	<0.128	<0.107	0.000
10/08/87	4587BR	<0.118	<0.143	<0.119	0.000
10/15/87	5487	<0.258	<0.313	<0.261	0.000
10/16/87	2187	<0.109	<0.132	<0.110	0.000
10/09/87	2287BR	<0.103	<0.125	<0.104	0.000
10/09/87	4387	<0.139	<0.168	<0.140	0.000
10/09/87	4487BR	<0.138	<0.168	<0.140	0.000
10/27/87	SP0187	<0.157	<0.190	<0.159	0.000
10/12/87	2287BR	<0.112	<0.135	0.000	<0.130
10/12/87	4387	<0.105	<0.128	<0.107	0.000
10/12/87	4587BR	<0.182	<0.221	<0.184	0.000
10/29/87	SP0287	<0.104	<0.126	<0.105	0.000
10/12/87	6187BH	<0.107	<0.130	0.000	0.000
10/17/87	4387	<0.132	<0.160	<0.133	0.000
11/02/87	SP0487	<0.108	<0.130	<0.109	0.000
11/02/87	SP0987	<0.101	<0.122	<0.102	0.000
11/24/87	6687	<0.100	<0.127	<0.102	0.000
11/25/87	6287	<0.132	<0.160	<0.133	0.000
11/03/87	SP0487	<0.110	<0.134	<0.112	0.000
11/30/87	6387	<0.096	<0.117	<0.097	0.000
11/20/87	6087	<0.107	<0.129	<0.108	0.000
11/23/87	6687	<0.124	<0.150	<0.126	0.000
11/13/87	SP1587	<0.180	<0.218	<0.182	0.000
11/23/87	5987	<0.114	<0.138	<0.115	0.000
11/24/87	6187	<0.138	<0.167	<0.139	0.000
11/12/87	SP0787	<0.130	<0.157	<0.131	0.000
11/20/87	5987	<0.109	<0.133	<0.111	0.000
11/10/87	SP1287	<0.099	<0.120	<0.100	0.000
11/19/87	SP0687	<0.096	<0.117	<0.097	0.000
11/10/87	SP1087	<0.126	<0.153	<0.128	0.000
11/11/87	SP1287	<0.111	<0.135	<0.113	0.000
11/11/87	SP1087	<0.118	<0.143	<0.119	0.000
11/19/87	6087	<0.101	<0.123	<0.102	0.000
11/12/87	SP1487	<0.115	<0.140	<0.117	0.000
11/13/87	SP0787	<0.107	<0.129	<0.108	0.000
11/06/87	SP1387	<0.153	<0.185	<0.155	0.000
11/06/87	SP0587	<0.115	<0.140	<0.117	0.000
11/17/87	5887	<0.123	<0.149	<0.125	0.000
11/09/87	SP1087	<0.107	<0.130	<0.108	0.000
11/18/87	5887	<0.109	<0.132	<0.110	0.000
11/09/87	SP1387	<0.107	<0.129	<0.108	0.000
11/18/87	SP0687	<0.104	<0.127	<0.106	0.000
11/03/87	SP1187	<0.113	<0.136	<0.114	0.000
11/04/87	SP0487	<0.107	<0.129	<0.108	0.000
11/04/87	SP1187	<0.108	<0.131	<0.110	0.000
11/05/87	SP0587	<0.101	<0.122	<0.102	0.000

International, 1988). There were no deflections of the photoionization detector noted during the recent well installations on the 881 Hillside Area.

4.1.2.3 903 Pad Area

The potential exists to encounter chlorinated hydrocarbons at the 903 Pad Area during field activities. The 903 drum storage site (SWMU 112) was utilized as a storage facility for drums containing radioactive contaminated lathe coolant. The lathe coolant consisted of approximately 70% hydraulic oil and 30% carbon tetrachloride. Maximum reported chlorinated hydrocarbon concentrations in groundwater south of the 903 Pad Area are 28,800 ppb of trichloroethylene in well 2-71 and 4,800 ppb of carbon tetrachloride in well 1-71.

The 903 Pad Area contains uranium and plutonium. The drum storage site (SWMU 112) contains approximately 1.7 Ci of plutonium, and the lip area (SWMU 155) contains approximately 0.4 Ci of plutonium. Trench T-2 (SWMU 109) contains flattened drums also contaminated with uranium and plutonium (DOE, 1988a).

4.1.2.4 Mound Area

The primary chemical hazards at the Mound Area are chlorinated hydrocarbons (tetrachloroethylene and trichloroethylene). The highest concentrations of these contaminants in groundwater were reported at well 1-74 during 1987 (tetrachloroethylene and trichloroethylene were reported at concentrations of 528,000 ppb and 18,000 ppb, respectively) (Rockwell International, 1987). Previous and subsequent analyses have indicated significantly lower concentrations of these compounds.

The Mound Area contains known radioactive contamination. The mound site (SWMU 113) originally contained approximately 1400 drums of depleted uranium with small amounts

of enriched uranium and plutonium. These drums were removed and disposed of off site in 1970. Trench T-1 (SWMU 108) contains approximately 125 drums of depleted uranium chips coated with lathe coolant. Two drums in Trench T-1 were uncovered in 1982 and were sampled prior to off site disposal. One drum contained 55 pCi/g plutonium and 230,000 pCi/g uranium. The other drum contained 4.3 pCi/g plutonium and 1,200,000 pCi/g uranium. Oil burn pit No. 2 (SWMU 153) and the pallet burn site (SWMU 154) may also contain radionuclides.

4.1.2.5 East Trenches Area

The primary chemical hazards at the East Trenches Area are chlorinated hydrocarbons. The maximum concentrations of chlorinated hydrocarbons reported in ground water since 1986 are 4,654 ppb of tetrachloroethylene (November 1987), 131,820 ppb of trichloroethylene (March 1988), and 5,427 ppb of chloroform (November 1987) in well 36-87, and 63 ppb of t-1,2-dichloroethylene (September 1986) and 4,835 ppb of carbon tetrachloride (September 1987) in well 42-87 (Rockwell International, 1987).

Wells 41-86 and 7-74 are located east of trenches T-4 to T-11 (SWMU 111). Tetrachloroethylene was detected in ground water from well 41-86 with a concentration of 160 ppb (May 1987). Chloroform (7 ppb), carbon tetrachloride (150 ppb), trichloroethylene (16 ppb), and tetrachloroethylene (36 ppb) were detected in well 7-74 in the samples collected in September 1987 (Rockwell International, 1987).

The east trenches contain known uranium and plutonium. Trench T-3 (SWMU 110) contains flattened drums contaminated with uranium and plutonium. Trenches T-4 to T-11 (SWMU 111) contain plutonium and uranium contaminated asphalt planking from the solar evaporation ponds. Maximum radionuclide concentrations detected in ground water during 1986 and 1987 occurred in wells 22-74 and 42-86 adjacent to the east trenches. These values

were 0.50 pCi/l, 0.07 pCi/l, 9.8 pCi/l, 11 pCi/l and 210 pCi/l for plutonium, americium, uranium233+234, uranium238 and tritium, respectively (Rockwell International, 1987).

4.1.2.6 Present Landfill

Chemical hazards of potential concern at the Present Landfill include volatile organic compounds and radionuclides. However, volatile organics generally did not occur above detection limits in ground-water samples from monitor wells in the vicinity of the landfill. In addition, all radionuclide concentrations in ground water downgradient of the landfill were within ranges established for upgradient conditions, or were below the minimum detectable activity (DOE, 1988).

4.1.2.7 Solar Evaporation Ponds

Chlorinated hydrocarbons are a potential chemical hazard around the Solar Evaporation Ponds. In addition, radiation is considered a potential hazard since these ponds were used to contain radioactively contaminated liquid wastes (DOE, 1988a).

Maximum levels of chlorinated hydrocarbons in the ground water from wells in the vicinity of the Solar Evaporation Ponds were found in well 22-86 in 1987. Carbon tetrachloride, 1,2-dichloroethane, and 1,1,1-trichloroethane were present in concentrations of 3,000 ppb, 8,000 ppb, and 1,400 ppb, respectively.

Maximum radionuclide concentrations detected in ground water occurred in well 28-86. These values were 1,797 pCi/l of total uranium and 12,000 pCi/l of tritium. These maximum concentrations were present in the samples collected in 1987 (DOE, 1988b).

4.1.2.8 West Spray Field

Previous sampling in the West Spray Field area has indicated the presence of elevated nitrate levels in the soil. Radionuclides and volatiles were not detected in soils. Analytical results from wells downgradient of the West Spray Field did not indicate volatile organic contamination. There were no deflections of the photoionization detector noted during well installations in the West Spray Field.

4.1.2.9 Original Process Waste Lines

Potential contaminants of concern are radionuclides, solvents, and acids. No wells currently exist near the original process waste lines to verify the presence of these contaminants.

4.2. PERSONNEL PROTECTION REQUIREMENTS

The Environmental Protection Agency (EPA) has established four levels of protection for personnel entering potentially hazardous zones. All personnel entering such a zone will be required to wear the attire designated for that zone.

4.2.1. Justification for Proposed Levels of Protection

Four levels of protection are associated with anticipated Operators Breathing Zone (OBZ) concentrations of volatile organic compounds as shown below (EPA 1984):

0 - background	--	Level D
bkg - 5 ppm	--	Level C
5 - 50 ppm	--	Level B
> 50 ppm	--	Exit site and inform the Subcontractor Site Health and Safety Coordinator, the ER Program Field Supervisor, and the HSE Area Safety Engineer

Volatile organics will be monitored using a photoionization detector in the breathing zone. The Operators Breathing Zone (OBZ) is that area of the work site at nose/mouth height.

Levels of protection are also associated with anticipated levels of radiation hazards. At a minimum, Level C protection will be required for all personnel performing a specific activity at a particular site that may expose them to radiation. In addition to this preventive measure, external exposure will be monitored using a Geiger-Mueller detector according to EPA guidance (EPA 1984). If radiation levels are below 1 mRem/hr, work will continue uninterrupted. If levels are in the range of 1-10 mRem/hr, work will stop and the Subcontractor Site Health and Safety Coordinator will evaluate the situation. At levels greater than 10 mRem/hr, personnel will leave the site immediately and notify the Subcontractor Site Health and Safety Coordinator, the ER Program Field Supervisor, the HSE Area Safety Engineer, and the ER Program Manager.

4.2.2. Proposed Levels of Protection for Specific Activities

The levels of protection for specific work activities at the sites are discussed below. These levels were established preliminarily by evaluating available site data, identifying anticipated levels of potential hazards, and assigning a level of protection based on the guidance outlined above. These levels of protection may be modified by the Subcontractor Site Health and Safety Coordinator according to specific field conditions, and following the procedures given in Section 3.5.

4.2.2.1. Activity 1 - Geophysical Surveys

For all non-intrusive geophysical surveys Level D protective gear will be used.

4.2.2.2. Activity 2 - Drilling and Well Installation

Background characterization, RCRA groundwater monitoring, source characterization, and plume delineation are the overall objectives of the drilling activities. Anticipated contaminant concentrations will vary greatly between the objectives. Therefore, initial drilling activities whose objective is source characterization will be performed in Level B or C protection. Drilling activities associated with background characterization, RCRA groundwater monitoring, and plume delineation will be performed in Level C or D protection. However, the final decision will be made through the evaluation of soil gas, ground water, geologic data, relative drilling locations, quantitative exposure information from previous drilling, and the type of field activity to be performed.

4.2.2.3. Activity 3 - Development, Sampling, and Testing of Monitor Wells

Monitor wells will be developed, sampled, and tested in the investigation. The same protection level evaluation stated in Activity 2 will be performed for these activities. In addition, a final protection level decision will be made upon headspace and breathing zone analyses using a photoionization detector.

4.2.2.4. Activity 4 - Surface Water

Surface water will be collected from Walnut Creek, Woman Creek, Rock Creek, springs, and seeps. Level D protective gear will be used for this activity.

4.2.2.5. Activity 5 - Surface Soil and Sediment

Sediment samples from Walnut, Woman, and Rock Creeks will be sampled. Level D protection will be used for this activity. Surficial soil samples will be taken throughout the

Rocky Flats Plant site. Level C protection will be required within perimeter fences of the 903 Pad Area, the Mound Area, and East Trenches Areas. Level D protection will be used at the other locations.

4.2.2.6. Activity 6 - Waste Source Sampling - Invasive Procedures

Level B protective gear is required for invasive sampling since the contents and concentrations of the wastes are unknown. Refer to Activity 2.

4.2.3. Protective Equipment

A variety of safety equipment will be used to protect personnel from safety hazards and minimize exposures to hazardous chemicals and radionuclides during site characterization (remedial investigation) activities. An organic vapor analyzer, photoionization detector, and alpha/beta/gamma detectors will be required for initial entry onto all sites. In addition, Class D fire extinguishing material is required for entry to the East Trenches Area. Additional protective equipment, although not required, will be available as needed. Required protective equipment may be deemed optional if current monitoring data indicate that hazards of concern are not present.

4.2.4. General Safety Practices and Mitigation Measures

Some hazards can be minimized through implementation of specific procedures, use of special equipment, training of personnel, or availability of emergency response equipment in the event of an accident. Health and Safety status meetings will be held daily for all personnel involved in field activities. These meetings will be used to express health and safety concerns and to update all personnel on the day's activities.

4.3. SITE ACCESS CONTROL

4.3.1. Restricted Access Zones

Control zones will be established prior to the commencement of work at contaminated sites. The exclusion zone will include an approximately twenty-foot radius around the work site. The actual dimensions of this zone will take into consideration the space required for safe operation of equipment, topography of the site, extent of contamination, and potential for airborne transport. If this exclusion zone intersects the boundary fences around some of the sites, controlled clothing for all personnel must be implemented. Specific procedures are stated in the OSA (Appendix B). Plant radiation monitoring is mandatory before releasing personnel and equipment from a designated controlled site. Additional radiometric surveys include the survey of all drilling cores, predrilling, and post drilling of the work area.

4.3.2. Decontamination

Decontamination is required for personnel, equipment, samples, and vehicles to prevent the spread of contamination to adjacent areas, reduce the possibility of cross-contamination of wells and samples, and protect employees. The decontamination of equipment and personnel will be conducted in steps from the exclusion zone through one or more contamination reduction zones to a final clean zone. The following decontamination procedures will be initiated after each sample or prior to leaving the contamination reduction zone. Decontamination procedures are listed by personnel protection levels.

Level D

Minimum personnel decontamination - Dispose of Level D protective clothing.

Minimum equipment decontamination -

Step 1 - Wash equipment with an alkaline detergent.

Step 2 - Rinse with tap or distilled water for sampling equipment.

Level C and B

Minimum personnel decontamination: Level C and B decontamination will follow procedures as outlined by the Environmental Protection Agency (EPA 1985c) and the OSA (Appendix 1).

Minimum equipment decontamination:

- | | |
|--------|---|
| Step 1 | Brush excess soil and wash with an alkaline detergent. |
| Step 2 | Rinse with tap water (from a steam cleaner). |
| Step 3 | Survey with both the photoionization detector probe to determine if any residual contamination exists. If so, repeat steps 1, 2, and 3 until no contamination is detected. Proceed to the next sampling location. |

Where radioactive contamination of vehicles or equipment is suspected, an area of 100 sq cm will be smeared and counted with an alpha scintillation detector. A Geiger-Mueller detector will also be used when there is a potential for uranium contamination. The following guidelines will be used to decontaminate radioactively contaminated equipment for general use (NRC 1979).

Alpha Emitters

Removable (smears):	<20 dpm/100 cm ²
Nonremovable (fixed):	<250 dpm/100 cm ²

Beta and Gamma Emitters

Removable (smears):	<1000 dpm/100 cm ²
Nonremovable (fixed):	<5000 dpm/100 cm ² , average
	<15 000 dpm/100 cm ² , maximum

If these limits are exceeded, further decontamination will be necessary. If further measures fail to adequately decontaminate the equipment, it will be disposed of according to plant policy. All equipment and solvents used for decontamination shall be decontaminated or disposed of properly.

4.4. WORKER TRAINING

Health and safety training will be conducted and documented for all team members. Additionally, all team members shall have been provided with training which complies with OSHA standard 29CFR 1910.120. The level of training for each team member will be commensurate with job functions and potential hazards in work areas and comply with the RCRA Part B Operating Permit Application, Section H. Two members of each field team will be required to have current certification in American Red Cross Multi-Media First Aid and Cardiopulmonary Pulmonary Resuscitation (or the equivalent). In addition, training for all field team members will meet right-to-know requirements.

4.5. EMPLOYEE MEDICAL PROGRAM

Field team members shall participate in an employee medical examination program. Their suitability for conducting field sampling activities (including possible respirator use) will be evaluated and documented by a physician. Medical programs must comply with requirements of DOE Order 5480.1A Chapter VIII and OSHA standard 29CFR 1910.120.

4.6. RECORDS AND REPORTING REQUIREMENTS

Subcontractors will maintain health and safety records and submit reports, as required by DOE Orders, to the Subcontractor Project Manager(s). These will include the following:

- DOE Form 5484.3, Supplementary Record of Occupational Injuries and Illnesses

- DOE Form 5484.4, Tabulation of Property Damage Experience
- DOE Form 5484.5, Report of Property Damage or Loss
- DOE Form 5484.6, Annual Summary of Whole Body Exposures to Ionizing Radiation
- DOE Form 5484.7, Summary of Exposures Resulting in Internal Body Depositions of Radioactive Materials for CY
- DOE Form 5484.8, Termination Occupational Exposure Report
- DOE Form OSHA-200, Log of Occupational Injuries and Illness
- DOE Form EV-101A, Summary of Department of Energy and Department of Energy Contractor Occupational Injuries and Illnesses
- DOE Form 5821.1, Unplanned Releases Form

The Subcontractor Project Manager(s) will distribute copies of the reports to the ER Program Manager, the DOE-Rocky Flats Area Office, the DOE-Albuquerque Operations Office, and the Rockwell International Health, Safety, and Environment Department, as appropriate. Specific reporting responsibilities are given in the following subsection.

4.6.1 Exposure and Medical Records

Subcontractors will maintain confidential medical records for each field team member as indicated by the employee medical program. These records will identify individuals by name, date of birth, social security number, and additional identifiers as desired by the subcontractor. The employee's accident record and history of exposures and/or possible exposures to hazardous physical, chemical, or biological agents will be included with the medical records.

The Subcontractor Site Health and Safety Coordinator will prepare and submit to the Subcontractor Project Manager and the Rockwell International ER Program Manager, radiation exposure reports as required in DOE Order 5484.1. Form 5484.8, "Termination Occupational Exposure Report," will be completed for any employee included in a radiation

monitoring program upon termination of employment. Forms 5484.7, "Summary of Exposures Resulting in Internal Body Depositions of Radioactive Materials for CY 19XX," and 5484.6, "Annual Summary of Whole Body Exposures to Ionizing Radiation," will be submitted annually by March 31 for monitored employees. These reporting requirements are currently under revision by DOE, and the Subcontractor Site Health and Safety Coordinator shall comply with the new requirements when they become final.

4.6.2 Accident/Incident Reports

The Subcontractor Site Health and Safety Coordinator will notify the Subcontractor Project Manager, the ER Program Field Supervisor, the ER Program Manager, and the HSE Area Safety Engineer of any accidents or incidents that occur during field activities. The Subcontractor Site Health and Safety Coordinator will also submit a completed DOE Form F 5484.X (Appendix C) for any of the following incidents:

- (1) "Recordable" occupational injuries or illnesses are defined below:

OCCUPATIONAL INJURY is any injury such as a cut, fracture, sprain, or amputation that results from a work accident or from an exposure involving a single incident in the work environment. NOTE: Conditions resulting from animal or insect bites, or one-time exposure to chemicals, are considered to be injuries.

OCCUPATIONAL ILLNESS of an employee is any abnormal condition or disorder, other than one resulting from an occupational injury, caused by exposure to environmental factors associated with employment. It includes acute and chronic illnesses or diseases which may be caused by inhalation, absorption, ingestion, or direct contact with a toxic material.

- (2) PROPERTY DAMAGE LOSSES of \$1,000 or more are reported as follows: accidents which cause damage to DOE property, regardless of fault, or accidents wherein DOE may be liable for damage to a second party, are reportable if damage is \$1,000 or more. Include damage to facilities, inventories, equipment, and properly parked motor vehicles. Exclude damage resulting from a DOE reportable vehicle accident.
- (3) GOVERNMENT MOTOR VEHICLE ACCIDENTS resulting in damages of \$250 or more, or involving an injury, are reported unless the Government vehicle is not at fault, damage of less than \$250 is sustained by the Government vehicle, and no injury is inflicted on the Government vehicle occupants. Accidents are also reportable to DOE if

- damage to a Government vehicle, not properly parked, is greater than or equal to \$250;

- damage to DOE property is greater than or equal to \$250 and the driver of a Government vehicle is at fault;
- damage to any private property or vehicle is greater than or equal to \$250 and the driver of a Government vehicle is at fault; and
- any person is injured and the driver of a Government vehicle is at fault.

4.7 EMPLOYEE INFORMATION

The Subcontractor Site Health and Safety Coordinator shall ensure that the following DOE forms are posted where field team members can easily read them:

- Form F 5480.2, Occupational Safety and Health Protection
- Form F 5480.4, Occupational Safety and Health Complaint Form

Also, the Rocky Flats Plant Health and Safety Standard concerning employee right-to-know shall be appropriately posted.

5. EMERGENCY RESPONSE AND NOTIFICATION

This section provides guidelines for responses to emergency situations.

5.1 EMERGENCY CONTACTS

Names of persons to contact in case of emergencies will be provided in the format found in Figure 5-1. This emergency contact form will be copied and posted in prominent locations at the work sites. Additional contacts are given in the Safety Evaluation Form (Appendix A).

5.2 CONTINGENCY PLANS

Field team leaders, with assistance from the Subcontractor Site Health and Safety Coordinator, shall have responsibility and authority for coordinating all emergency response activities until proper authorities arrive and assume control. A copy of these plans shall be available at the work site at all times, and all personnel working on the site shall be familiar with the plans. Evacuation plans and routes shall be on a job-specific basis, and all personnel shall be familiar with them.

5.2.1 Fire/Explosion

Any fire emergency will be handled by immediately notifying the fire department. Only if the fire appears to be small and easily extinguishable will personnel attempt control with fire extinguishers available in the work area. Otherwise, immediate evacuation of the area is indicated.

Site Health and Safety Coordinator--

Name: Janel B. Bergman

Call: (303) 966-7041

Installation Health and Safety Officer--

Name: J.D. Weaver

Call: (303) 966-7571

24-Hour Installation Health/Safety Coordinator--

Call: (303) 966-2911

FIRE-- Call: (303) 966-2911

AMBULANCE-- Call: (30) 966-2911

POISON CENTER-- (303) 629-1123

SECURITY-- Call: (303) 966-2911

POLICE-- Call: (303) 966-2911

YOU ARE LOCATED AT: T903 (903 Pad Trailer)

THE NEAREST TELEPHONE IS LOCATED AT:

Guard Post

THE NEAREST EMERGENCY MEDICAL SERVICES ARE LOCATED AT:

On Site

Figure 5.1. Emergency Contacts

If combustible gas/oxygen meters show explosive gas or oxygen concentrations approaching 25% of the lower explosive limits, all personnel will be evacuated and the fire department will be notified. In the event of an explosion, all personnel shall be evacuated and the fire department will be notified. In the event of an explosion, all personnel shall be evacuated and no one shall re-enter the area until it has been cleared by explosives safety personnel.

5.2.2 Personnel Injuries

In case of injuries to personnel, first aid treatment will be initiated immediately by trained personnel. In case of serious injuries, the victim will be transported to the Rocky Flats Plant medical center as soon as possible. Minor injuries may be treated on site, but all injuries will be examined by trained medical personnel. Victims of serious bites or stings will be taken to the Rocky Flats Plant medical center. In the event that an injured person is contaminated with chemicals or radionuclides, the person shall be taken as soon as possible to the Rocky Flats Plant medical center. Decontamination shall be performed to prevent further exposure only if it will not aggravate the injury. Treatment of life-threatening or serious injuries will always be considered first.

5.2.3 Accidental Releases of Radionuclides to the Environment

In case of releases of radionuclides to the environment (such as a spill of samples being transported for analysis), emergency response shall be in accordance with Rocky Flats Plant procedures. The Subcontractor Site Manager or Field Team Leader shall notify the Rockwell International ER Program Manager, Field Supervisor, and HSE Area Safety Engineer of such an event.

5.3 NOTIFICATION REQUIREMENTS

Reporting and notification of emergency situations shall be carried out in accordance with requirements in DOE Order 5484.1. The Field Team Leader will notify appropriate emergency assistance personnel (e.g., fire, police, ambulance at ext. 2911) immediately, and then notify the Subcontractor Site Manager. The Subcontractor Site Manager will notify the Rockwell International ER Program Field Supervisor, Program Manager, and HSE Area Safety Engineer. The responsibility of the Subcontractor Site Health and Safety Coordinator is to implement notification and reporting requirements of DOE Order 5484.1.

6. ENVIRONMENTAL MONITORING & PROTECTION

Environmental impacts from field activities are expected to be negligible. However, additional sampling to supplement Rocky Flats Plant routine monitoring activities is considered necessary due to the potential of air suspension of contaminants from source characterization locations and/or existing radionuclide dust resuspension areas. Proper air monitoring procedures are found in the OSA (Appendix B). The ER Program Field Supervisor is responsible for coordinating air sampling equipment.

In order to negate dust resuspension, a soil binder (i.e. coherex) will be applied four hours prior to equipment set-up. The binder will be applied to form a pathway from the nearest established road to the drilling location. The ER Program Field Supervisor is responsible for coordinating the initial application of the soil binder and possible reapplication due to heavy use or rains. All vehicular traffic must stay on these pathways and established roads. Established roads are those which are paved with gravel.

7. REFERENCES

- DOE 1988a: "Resource Conservation and Recovery Act Part B - Operating Permit Application for USDOE Rocky Flats Plant, Hazardous and Radioactive Mixed Wastes," US Department of Energy, April 1988.
- DOE 1988b: "Resource Conservation and Recovery Act Post-Closure Care Permit Application--for USDOE Rocky Flats Plant, Hazardous and Radioactive Mixed Wastes," U.S. Department of Energy, October 1988.
- EPA 1984: "Standard Operation Safety Guides," US Environmental Protection Agency, Office of Emergency and Remedial Response unnumbered report, 1984.
- EPA 1985c: "Personnel Protection and Safety," US Environmental Protection Agency unnumbered report, Office of Emergency and Remedial Response, Washington, D.C., November 1985.
- NRC 1979: "Health Physics Surveys for By-product Material at NRC Licensed Processing and Manufacturing Plants," Nuclear Regulatory Guide 8.21, Nuclear Regulatory Commission report, 1979.
- Rockwell International, 1987, 903 Pad, Mound, and East Trenches Areas Remedial Investigation Report, U.S. Department of Energy, Rocky Flats Plant, Golden, Colorado.
- Rockwell International, 1988, Remedial Investigation Report for High Priority Sites (881 Hillside Area), U.S. Department of Energy, Rocky Flats Plant, Golden, Colorado.

APPENDICES

- A. HEALTH AND SAFETY PLAN**
- B. OPERATIONAL SAFETY ANALYSIS (OSA)**
- C. UNUSUAL OCCURRENCE REPORTING CRITERIA AND FORMAT**

APPENDIX A

ADDITIONAL HEALTH AND SAFETY INFORMATION

- A-1 Rocky Flats Plant Safety Evaluation Form**
- A-2 Chemical Hazards of Concern**
- A-3 Radiological Hazards of Concern**
- A-4 Health and Safety Training Outline**

APPENDIX A-1

ROCKY FLATS PLANT SAFETY EVALUATION FORM

WORK LOCATION PERSONNEL PROTECTION
AND SAFETY EVALUATION FORM

Attach Pertinent Documents/Data

Fill in Blanks _____

WO # _____

Reviewed by _____

Division _____

Date _____

Office _____

Approved by _____

Prepared by _____

Date _____

Date _____

A. Work Location Description

1. Name _____

2. Location _____

3. Type: HW Site ()

Industrial ()

Spill ()

Construction ()

() Existing work Location

Other () Describe _____

4. Status _____

5. Anticipated activities: _____

6. Size _____

7. Surrounding Population _____

8. Buildings/Homes/Industry _____

9. Topography _____

10. Anticipated Weather_____

11. Unusual Features_____

12. Site History_____

B. Hazard Description

1. Background Review: Complete () Partial ()

If partial, why?_____

2. Hazard Levels:* A () B ()

Unknown () C () D ()

Justification_____

3. Types of Hazards: (Attach additional sheets as necessary)

A. Chemical () Inhalation () Explosive ()

Biological () Ingestion () O₂ Def. ()

Skin Contact () toxic ()

Describe_____

B. Physical () Cold Stress () Noise ()

Heat Stress () Other ()

Describe_____

C. Radiation ()

Describe _____

4. Nature of Hazards:

Air () Describe _____

Soil () Describe _____

Surface Water () Describe _____

Ground Water () Describe _____

Other () Describe _____

5. Chemical Hazards of Concern

6. Radiological Hazards of Concern

7. Work Location Instrument Readings () N/A

Location _____

% O₂ _____

Radioactivity _____

FID _____

Other _____

Location _____

% O₂ _____

Radioactivity _____

FID _____

Other _____

Location _____

% O₂ _____

Radioactivity _____

FID _____

Other _____

Location _____

% O₂ _____

Radioactivity _____

FID _____

Other _____

% LEL _____

PID _____

Other _____

Other _____

% LEL _____

PID _____

Other _____

Other _____

% LEL _____

PID _____

Other _____

Other _____

% LEL _____

PID _____

Other _____

Other _____

8. Hazards expected in preparation for work assignment.
() N/A

Describe: _____

To be Completed For Site-Specific Health and Safety Plans

C. Personnel Protective Equipment

1. Level of Protection

To Be Completed For Site-Specific Health and Safety Plans

A () B () C () D () Location/Activity:

A () B () C () D () Location/Activity:

2. Protective Equipment (specify probable quantity required)

Respiratory () N/A

Clothing () N/A

() SCBA, Airline

() Fully Encapsulating Suit

() Full Face Respirator
(Cart. _____)

() Chemically Resistant
Splash Suit

() Apron, Specify _____

() Escape Mask

() Tyvek Coverall

() Saranex Coverall

() None

() Coverall, Specify _____

() Other _____

() Other _____

() Other _____

() Other _____

Head & Eye () N/A

Hand Protection () N/A

() Hard Hat

() Undergloves _____
Type

() Goggles

() Gloves _____
Type

() Face Shield

() Overgloves
Type

() Chemical Eyeglasses

() None

() None

() Other _____ () Other _____

Foot Protection () N/A

() Safety Boots

() Disposable Overboots

() Other _____ To Be Completed For Site-Specific Health and Safety Plans

3. Monitoring Equipment () N/A

() CGI () PID

() O₂ Meter () FID

() Rad Survey () Other _____

() Detector Tubes _____

Type: _____ () Other _____

D. Personnel Decontamination (Attach Diagram)

Required () Not Required ()

Equipment Decontamination (Attach Diagram)

Required () Not Required ()

If required, describe and list equipment _____

E. Personnel

<u>Name</u>	<u>Work Location Title/Task</u>	<u>Medical Current</u>	<u>Fit Test Current</u>	<u>Certifi- cation Level</u>
1.		()	()	()
2.		()	()	()
3.		()	()	()
4.		()	()	()
5.	To Be Completed For	()	()	()
6.	Site-Specific Health and	()	()	()
7.	Safety Plans	()	()	()
8.		()	()	()
9.		()	()	()
10.		()	()	()

Site Safety Coordinator _____

F. Activities Covered Under This Plan

Task No.	Description	Preliminary Schedule
----------	-------------	----------------------

H. Contingency Contacts

Agency	Contact	Phone Number
Fire Department		
Fire Department		
Police Department		
Health Department		
Poison Control Center		
State Environmental Agency		
EPA-Regional Office		
EPA-ERT. ICOM		
Spill Contractor		
State Police		
F.A.A.		
Civil Defense		
Onsite Coordinator		
Site Telephone		
Nearest Telephone		
	Location	

Other _____

I. Contingency Plans

Spills, Accidental Release; Describe_____

Fire Explosion; Describe_____

Other; Describe _____

MEDICAL EMERGENCY

Address: _____ Phone No. _____

Addresses: _____ Phone No. _____

Name/Number of 24-Hr. Ambulance Service _____

HEALTH AND SAFETY PLAN
APPROVAL/SIGN OFF FORMAT

I have read, understood, and agreed with the information set forth in the Health and Safety Plan (and attachments) and discussed in the Personnel Health and Safety briefing.

_____	_____	_____
Name	Signature	Date
_____	_____	_____
Name	Signature	Date
_____	_____	_____
Name	Signature	Date
_____	_____	_____
Name	Signature	Date
_____	_____	_____
Site Safety Co-ordinator	Signature	Date
_____	_____	_____
Director, Corporate Health and Safety	Signature	Date
_____	_____	_____
Project Manager	Signature	Date
_____	_____	_____
Project Director/ Department Manager	Signature	Date
_____	_____	_____
Personnel Health and Safety Briefing Conducted By:		
_____	_____	_____
Name	Signature	Date

APPENDIX A-2
CHEMICAL HAZARDS OF CONCERN

Table A-1. Chemical Hazards of Concern

Contaminant	TLV	I.D.L.H.	Source/Quantity Characteristics	Instrument Used To Monitor Contaminant
1,1,-dichloroethylene	5 ppm	4000ppm	in groundwater	H-nu, detector tubes explosimeter
1,1-dichloroethane	100 ppm PEL	4000ppm	in groundwater	H-nu, detector tubes explosimeter
Acetone	750ppm	20,000ppm	unknown	Charcoal;GC
Asbestos	.2 fibers> 5 um/cc	Ca	fine slender, flaxy fibers	NIOSH 77-157A
Beryllium (Be)	2 ug/m ³	Ca	unknown	NIOSH 77-157A
Cadmium (Cd)	0.05mg/m ³	40mg/m ³ ,Ca	Variable	filter,acid,AA
Cadmium Cyanide	5.0mg/m ³	50 mg/m ³	Variable	filter,bub.,OH,1SE
Carbon tetrachloride	5ppm	Ca	in groundwater	H-nu, detector tubes
Chloroform	10ppm	Ca	in groundwater	H-nu, detector tubes
Chromic Acid (CrO ₃)	0.05 mg/m ³ (TLV)	30mg/m ³	Variable	filter,H ₂ SO ₄ , diphenyl-carbazide, color
Chromium (Cr)	1mg/m ³	500mg/m ³	Variable	filter,acid,AA
Copper (Cu)	1mg/m ³	NA	dusts,mists	filter,acid,AA
Fuel Oil	N/A	N/A	in soil	H-nu, explosimeter
Lead (Pb)	0.05mg/m ³	Variable	Variable	Filter,HNO ₃ ,AA
Mercury (Hg)	0.05mg/m ³	28mg/m ³	Silvery, liquid	AA

Table A-1. (Continued)

<u>Contaminant</u>	<u>TLV</u>	<u>I.D.L.H.</u>	<u>Source/Quantity Characteristics</u>	<u>Instrument Used To Monitor Contaminant</u>
Nickel	0.1mg/m ³	Ca	Variable	filter, acid, AA
PCB's	0.5mg/m ³	5mg/m ³ , Ca	unknown	filter, GC
Sodium Hydroxide	2mg/m ³	mg/m ³	unknown	filter, HCl, titration
Solvents	NA	NA	unknown	Charcoal, GC
Tetrachloroethylene	50ppm	250 mg/m ³	in groundwater	H-nu, detector tubes
Tin (Sn)	0.1 mg/m ³	200mg/m ³	Variable	NIOSH 77-157A
Trichloroethane	350ppm	1000ppm	in groundwater	H-nu, detector tubes
Trichloroethylene	50ppm	Ca	in groundwater	H-nu, detector tubes explosimeter
Vinyl chloride	1ppm	Ca	in groundwater	H-nu, detector tubes explosimeter

*Where Ca appears, it is recommended that the substance be treated as a potential human carcinogen.

N/A - not applicable

APPENDIX A-3

RADIOLOGICAL HAZARDS OF CONCERN

Table A-2. Radiological Hazards of Concern

ISOTOPE	RADIATIONS	AIR MPC (uCi/CC) WORKERS	MPBB (uCi)	CO	HALF-LIFE		MONITORING INSTRUMENT
					RADIOACTIVE	BIOLOGICAL DAYS	
H-3	beta	5×10^{-6}	1000	body tissue	12.262y	12	Scintillation- liquid
Pu-238	alpha, gamma	2×10^{-12}	0.04	Bone	86.4y	73,000	Scintillometer
Pu-239	alpha, gamma	2×10^{-12}	0.04	Bone	24,390y	73,000	Scintillometer
Sr-90	beta,D	1×10^{-9}	2	Bone	27.7y	18,000	G-M
U-238	alpha,X,D	7×10^{-11}	0.005	Kidney	4.51×10^{-9} y	15	Scintillometer

MPC - maximum permissible concentration in air for radiation workers on a 40-hour work week

MPBB - the amount of the isotope maintained in the body which will deliver the maximum permissible dose equivalent rate to the limiting organ

Critical organ - the organ that receives the highest dose equivalent from a sustained intake

D - daughter radiations with half-lives less than 25 years

X - x-radiations from orbital electrons

APPENDIX A-4

HEALTH AND SAFETY TRAINING OUTLINE

Training Outline

- I. Training Purpose and Objectives
- II. Identification and Recognition of Health and Safety Hazards at the Rocky Flats Plant Facility
 - A. Physical Hazards
 - o noise
 - o heat
 - o cold
 - o structures
 - B. Chemical Hazards
 - o volatile organics
 - o asbestos
 - o beryllium
 - C. Radiological Hazards
 - o plutonium
 - o americium
 - o tritium
 - o uranium
 - D. Summary of Principal Hazards and Health Effects
 - o chemical exposures
 - o external exposures to radionuclides
 - o internal exposures to radionuclides
 - o potential health effects for women and fetuses
- III. Radiological Safety and Monitoring Requirements
 - A. Controlled Area Restrictions
 - o eating/drinking
 - o smoking
 - o chewing
 - o access control points
 - B. Protective Equipment Requirements
 - o clothing: hard hats, boots, gloves, coveralls
 - o respiratory protection
 - C. Procedures for Using Protective Equipment
 - o respiratory fit-test and use
 - o impermeable clothing

- D. Personnel Contamination Monitoring and Decontamination
- IV. Emergency Response Requirements
 - A. Locations and Methods of Accessing Emergency Assistance
 - B. Emergency Notification Procedures
- V. Hazard Communication Information (Right-to-Know)
 - A. List of Hazardous Materials

APPENDIX B
OPERATIONAL SAFETY ANALYSIS (OSA)

OPERATIONAL SAFETY ANALYSIS [OSA]

OSA NUMBER 250.002

TITLE Remedial Investigation Drilling and Sampling Program.

OPERATION

This OSA describes procedures and guidelines to be followed during the drilling and ground water sampling for the Remedial Investigations (RI) Programs. The Environmental Restoration Program (ERP) health and safety plans outlines general health and safety controls. Specific procedures related to Plant permits, personnel, procedures and waste handling as well as job responsibilities are addressed in this OS

RESPONSIBILITY

<u>Brent Lewis</u>	<u>Adv. Env. Eng.</u>	<u>RCRA/CERCLA</u>
<u>[Name]</u>	<u>[Position]</u>	<u>[Organization]</u>

is responsible for this operation. It is his/her responsibility to ensure the operation is carried out in accordance with the OSA and that employees performing this operation are familiar with the document.

CHANGES

No changes will be made in this OSA without coordinating the change through the HS&E Area Engineer. He/she will determine if any additional reviews and/or approvals are necessary.

CONCURRENCE

R. J. Edwards
Director, AS&E [Signature]

2/8/89
Concurrence Date

APPROVAL AUTHORITY

W. F. Weston, Director, Plutonium Operations
[Type Name and Title or Approval Authority]

is the final Approval Authority for this OSA.

W. F. Weston
Approval Authority [Signature]

Jan 30 1989
Approval Date

OSA DOC/1.17

OK. MO 1-16-89
"REVIEWED FOR CLASSIFICATION" (U)
By BARBARA KERR GREER BKG
Date 12-8-88

OCCUPATIONAL SAFETY ANALYSIS (OSA)

JOB TITLE: Remedial Investigation Drilling and Sampling Program

OPERATION: This OSA describes procedures and guidelines to be followed during the drilling and ground water sampling for the Remedial Investigations (RI) Program. The Comprehensive Environmental Assessment and Response Program Health and Safety Plan outlines the general procedures of health and safety control. Specific procedures related to Plant permits, personnel, procedures and waste handling, as well as job responsibilities, are provided in the OSA.

<u>Basic Jobs/Responsibility</u>	<u>Potential Hazard</u>	<u>Hazard Control</u>
1. Excavation Permits and Land Use Permits. Construction Coordinator, Environmental Management are responsible.	Underground utilities, power lines, flame control, general safety and improper land use.	Inspection of each drilling site by Construction Management. Inspect for listed hazard identification and general safety regulations and to monitor buffer zone activity to minimize environmental impacts.
2. Coordinate overall job safety. CEARP Health and Safety Coordinator is responsible for the implementation of the CEARP Health and Safety Plan.	Personnel exposure to radioactive and/or hazardous wastes and bodily injury.	The CEARP Health and Safety Coordinator is responsible for implementation and auditing of the requirements in the CEARP Health and Safety Plan. The Coordinator is also responsible for the coordination of passive charcoal dosimeters to assess organic exposure levels.
3. Restricted access to drilling operations. The CEARP Health and Safety Coordinator and the Subcontractor Health and Safety Coordinator are responsible.	Contaminant contact. Minimize contact by wearing appropriate designated protective clothing.	Designated contaminated sites are those areas delineated with a barbless fence. The restricted access boundary is extended outward to include drilling operations within 30 feet of a barbless fence. All personnel, visitors included, must wear white coveralls and booties prior to

Basic Job/Responsibility

Potential Hazard

Hazard Control

4. Radiation Survey of Personnel and Equipment. Radiation Monitoring is responsible for surveying and release of personnel and equipment from designated contaminated work sites. The site geologist or the subcontractor Health and Safety Coordinator will notify radiation monitoring when needed.

Radiation migration from control area to clean areas.

entering or visiting a designated contaminated site. Personnel entering drill rig exclusion zones (a physically delineated boundary approximately 30 feet around the working area of each rig) must wear personal protective clothing and equipment specified by the CEARP Health and Safety Coordinator.

All personnel, samples, drilling core and equipment will be surveyed by radiation monitoring and must meet plant requirements before being released from the area. Less than 20 dpm/100cm² alpha removable, less than detectable alpha activity fixed, ambient background activity using the fiddler and less than 1,000 dpm/100cm² beta activity.

5. Radiation Survey of drilling location. Construction Coordinator and Radiation Monitoring are responsible.

Radiation nuclide resuspension and impact assessment.

A pre-drilling survey using a fiddler will be performed to determine the baseline for each location near designated contaminant sites or within the Plant perimeter fence. A post survey will also be performed to assess any impacts at the end of each day.

Basic Job/Responsibility

6. Ambient Air High Volume. CEARP Health and Safety Coordinator and the Subcontractor Site Health and Safety Coordinator will coordinate with Environmental Management.

Potential Hazard

C o n t a m i n a n t
resuspension.

Hazard Control

Ambient air sampling (with high volume air samplers) will be required only where the potential for the resuspension of radioactive soil exists. The need for ambient air sampling will be determined separately for each site by the Environmental Management personnel member responsible for signing the excavation permit.

Position ambient air high volume air samplers equipped with ground fault protection downwind at operations. Filters to be changed daily by Radiation Monitors.

Reviews and/or discontinue operation if any of the following exists: 1) Wind velocity exceeds 15 mph. Environmental Management will evaluate the impact of between 10 and 15 mph. Continuation of the drilling operation will be based upon the type and location of the drilling activity. Vehicular traffic must be minimized. 2) If radiation monitors determine cutting activities are over background, moisture control and/or a soil stabilizer (e.g., coherex) must be used for dust suppression. 3) Ambient air

Basic Job/Responsibility

Potential Hazard

Hazard Control

7. Restricted vehicular access. Subcontractor site manager are responsible for implementation. Construction Coordinator is responsible for coherex and gravel application.

Contaminant resuspension and environmental impacts.

high volume samplers of total long-lived alpha which exceed 0.03 pCi/m^3 will require corrective action based on recommendations by Environmental Management and Radiation Safety.

Access paths which will be used by vehicles will be prepared with gravel and/or soil stabilizer (coherex) as determined necessary by Environmental Management personnel. This will reduce erosion and soil resuspension. Vehicular traffic in the vicinity of the 903 Pad area will be restricted to only prepared surfaces. These road surfaces must be built ON TOP OF the present ground cover of the area without cutting or scraping the present ground surface.

8. Drill Cutting Handling. Determine if drill cuttings are "contaminated" (see Reference: Operational Safety Analysis No. RFOSA (Sept. 7, 1984). Radiation Monitoring is responsible. The drill rig geologist will coordinate with the CEARP's Health and Safety Coordinator and the Subcontractor Site Manager on containment of drill cuttings. The CEARP Health & Safety

Potential contamination of otherwise non-contaminated areas and limit personnel exposure.

If drill cuttings at a drill site exceed background (approximately 250 cpm using a Fiddler as references in OSA1) as determined by Radiation Monitors, cuttings will be placed in designated half-boxes. If radioactivity is below background (approximately 250 cpm), cuttings will be distributed on the surface of the immediate area. If

Basic Job/Responsibility

Potential Hazard

Hazard Control

9. Fluid Handling. The CEARP Health & Safety Coordinator & Subcontractor Site Manager are responsible for contracting the onsite laboratory for sampling. Liquid Waste Operations for any sludge. A sample from each tanker truck shipment will be taken prior to its transfer to Liquid Waste Processing. In addition, Radiation Monitoring must be contacted to survey all containers before exiting the site. Handling & transportation of the liquid to Liquid Waste Ops.

Surface sediment contamination.

organic contaminants are continually detected above background during drilling by the rig geologist's by direct reading instruments, the drill cuttings will be boxed. If the drilling core is over background (approximately 250 cpm), the core will also be contained in the designated half-boxes. If above background reading of contaminants are detected, all drilling fluid contained in the sediment basins from rotary drilling will be decanted into a tanker. The remaining cuttings/sludge will be mixed with absorbent material (vermiculite and cement) and placed into a half-box.

Fluids used at drilling locations which have above background concentrations of radioactivity and/or organics as determined from the drill cuttings, will be contained (see Step 8). Fluids will be collected in decontamination troughs. The liquid in these troughs will be decanted into a tanker truck. Care must be taken in preventing sample sediments from entering the tanker. The remaining solids left in the troughs will be mixed with

Basic Job/Responsibility

Potential Hazard

Hazard Control

absorbent material (vermiculite and cement) and placed in a half-box (see Step 8). If any volatile organic compounds detected 1.0 ppm above background in the headspace of each well, the ground water will be contained. Headspace analyses will be performed by the samplers using a HNu photoionization detector. Ground water generated from well development and purging will be contained and processed by the samplers. If no volatile organic compounds are found, the water will be disposed of on the ground surface in the immediate area. If above background radionuclide activity is detected during drilling in the zone of well completion the ground water will be contained.

10. Trash Generation. Drill site workers are responsible for collection and containment of solid trash in designated containers. Construction Coordinator and the Subcontractor Site Manager are responsible for contacting Waste Operations for transfer of solid waste trash drums.

Wind blown contaminated debris.

Trash generated within the exclusion areas of each drilling rig operating must be contained. This trash is to be placed in black and white "skunk" drums. Care must be taken to segregate non-contaminated trash from potentially contaminated trash. Non-contaminated trash will be disposed of in sanitary dumpsters. All personal outer protective clothing

Basic Job/Responsibility

Potential Hazard

Hazaard Control

(e.g. gloves, tyvex disposable booties, rags) used in exclusion zones must be placed in garbage bags. These bags are then to be placed into double vinyl lined bags designated for drums. Final disposition of drums will be determined by Waste Operations Coordinator.

11. Proper labeling of Waste Containers. Solid and Liquid Waste Operations management are responsible for proper labeling.

Illegal or unsafe storage, treatment, and disposal.

Waste Operations will determine appropriate labels for radioactive and hazardous waste constituents generated from the drilling program.

12. Field Activities Near Rifle and Pistol Ranges. CEARP Health and Safety Coordinator and the Subcontractor Health and Safety Coordinator are responsible.

Bodily injury due to gunshot wound.

All personnel operating south of excess road east of the perimeter fence and west of Pond C-2. Call Dispatcher x-2444. Reference: OSA: Firearms & Ammunition Storage. No 121.1.

13. Off-site Shipping of Samples. The RCRA and subcontracting site managers are responsible.

Proper shipping containers and labels to ensure proper handling and response in case of accidents.

Samples which have been determined to meet the definitions of hazardous materials in Part 173 or Title 49 of the Code of Federal Regulations (49 CFR) will be packaged, marked, labeled, described and transported in compliance with the requirements of 49 CFR Parts 171 through 178.

Environmental samples which are not subject to the above 49 CFR parts will be transported in accordance with 40 CFR (d)(2)(ii)(A) and (B).

For more information call Traffic at ext. 2377 or ext. 2378.

APPENDIX C
UNUSUAL OCCURRENCE REPORTING
CRITERIA AND FORMAT

UNUSUAL OCCURRENCE REPORTING

The following would be offered as typical examples of reportable events subject to the criteria listed in DOE Order 5484.2:

- a. Loss of capability by a protective system (control, safety, shutdown) to perform its intended function, e.g.:
 - (1) Failure of instrument systems designed to warn of airborne hazards, etc.
 - (2) Failure of a building or site emergency alarm system.
- b. Violation of a DOE approved technical specification, or operating safety requirement or other safety limits prescribed by DOE, e.g.:
 - (1) Violation of power, pressure, or temperature limits specified for safety purposes.
- c. Degradation of a barrier designed to contain radiation or toxic material or unplanned release of radioactive or toxic material past this barrier, e.g.:
 - (1) Leaks from pipes, valves, tanks, cells, or drums which could create on-site, off-site, or public concern.
 - (2) Holding pond failure or overflow.
 - (3) Release of radioactive/non-radioactive materials which results or could result in exposures to personnel.
- d. The loss of control of radioactive material or processes involving radioactive substances which indicates either operating or administrative control inadequacies, e.g.:
 - (1) Loss of contamination control which results in the spread of contamination outside established contamination/radiation zones.
 - (2) Personnel exposure in excess of approved limits.
 - (3) Personnel contamination.
- e. Fire or explosion, which substantially affects or directly threatens safe or reliable operation of the site.

- f. Unauthorized use of flammable, toxic, explosive, corrosive, or other unsafe or dangerous process, chemicals, materials, or methods previously prohibited.
- g. Design deficiency, construction or fabrication error found subsequently during construction, testing which, had it remained undetected, could have had an adverse effect on the performance, reliability or safety of the site at some point during its design lifetime, e.g.:
 - (1) Discovery of a design deficiency, such as insufficient liner thickness, which will require extensive modification.
 - (2) Inadequate or improperly located air sampling devices.
 - (3) Personnel barriers or guards missing or not correctly installed.
- h. Condition resulting from natural events or man-made activities which substantially affects or threatens performance, reliability or safe operation, e.g.:
 - (1) Disruption of water supply used for dust-control and decontamination.
 - (2) Personnel operations errors.
 - (3) Any penetration of an existing barrier which diminishes its integrity and thereby increases the risk to people, property, or the environment.
 - (4) Flood, rainstorms, or windstorm occurrences that cause excessive erosion or soil stability problems that threaten the structural integrity of the encapsulation process.
 - (5) Natural or man-made barriers that limit emergency access to, or egress from the site and/or site facilities.
- i. Deviation from approved procedures that results in performance, reliability or safety degradations, e.g.:
 - (1) Operation of construction equipment at temperatures and pressures above those specified.
 - (2) Repeated or flagrant failure of workers to use protective equipment.
 - (3) Deviation from a procedure that requires verbatim compliance.

- (4) Damage to systems/components attributable to failure to follow approved operating procedures.
 - (5) Unauthorized bypassing of a safety system.
- j. Any reportable event that will not satisfy the criteria of nonconformance and/or corrective action reporting as defined by ANSI/ASME NQA-1-1979.

DOE 5484.1

ATTACHMENT 3

REQUIREMENTS FOR NOTIFICATION OF OCCURRENCES

Chapter I

NOTIFICATION OF OCCURRENCES

1. IMMEDIATE NOTIFICATION. Notification to Headquarters Emergency Operations Center of the following occurrences shall be made as soon as sufficient information is obtained to indicate the general nature and extent of the occurrence:
 - a. Any fatal or imminently fatal injury or illness involving a Department of Energy or Department of Energy contractor employee or a member of the public due to an occurrence associated with a Department of Energy or Department of Energy contractor operation. (Type A investigation).
 - b. Any one occurrence (involving either occupational injuries or illness) in a Department of Energy or Department of Energy contractor operation which results in five or more lost workday cases. (Type A investigation).
 - c. Estimated loss or damage to Department of Energy or other property amounting to \$100,000 or more, or estimated costs of \$100,000 or more required for cleaning (including decontamination), renovating, replacing, or rehabilitating structures, equipment, or property. (Type A investigation, if the costs exceed \$250,000. See Chapter V of this Order "Criteria for Determining DOE Property Valuation and DOE losses.")
 - d. A single or annual accumulated whole-body exposure of an individual to 25 rem or more of radiation, a single exposure of the skin of the whole body of an individual to 75 rem or more of radiation, a single exposure of the forearms of an individual to 150 rem or more of radiation, or a single exposure of hands or feet of any individual to 375 rem or more of radiation. (Type A investigation.)
 - e. Any internal uptake of radioactive material which on the basis of a small number of early assay data could result in a dose or dose commitment in excess of 5 times the pertinent annual standard set forth in the chapter. For whole body dose, 5 rem is the pertinent annual standard. (Type A investigation.)
 - f. Any occurrence which is likely to give rise to an inquiry by members of the public or press, if the field organization head involved considers the inquiry to be of sufficient importance to notify Headquarters.

(Level of investigation shall be determined by the head of the field organization.)

- g. Any occurrence where a press release is made or where information is provided to the news media, other Federal agencies, or state or local authority, either by the field organization or a Department of Energy contractor. (Level of investigation shall be determined by the head of the field organization.)
- h. Any radiological assistance occurrence. (Level of investigation shall be determined by the head of the field organization.)
- i. Any discovery of significant radioactive or nonradioactive contamination in the onsite or offsite environment attributable to current or past Department of Energy operations.

2. NOTIFICATION WITHIN 72 HOURS. Notification to Headquarters of the following occurrences shall be made within 72 hours of the occurrence.

- a. Estimated loss or damage to Department of Energy or other property amounting to between \$50,000 and \$100,000 or estimated costs within these limits required for cleaning (including decontamination), renovating, replacing, or rehabilitating structures, equipment, or property. (Type B investigation is required for loss or damage between \$50,000 and \$250,000. See Chapter V of this Order, "Criteria for Determining DOE Property Valuation and DOE losses.")
- b. Any occupational illness which results in inpatient hospitalization. (Type B investigation.)
- c. Any series of occupational illnesses with the same or similar causes involving five or more persons of which at least one is a lost workday case. (Type B investigation.) If the occurrence results in five or more lost workday cases then a Type A investigation must be performed. See paragraph 16 of this Chapter.
- d. Any occupational illness which is a lost workday case involving more than 5 days away from work. (Type B investigation.)
- e. Any radiation exposure to an individual which in one calendar quarter exceeds the following (Type B investigation):

- (1) 5 rem to the whole body.
 - (2) 15 rem to skin of whole body or thyroid.
 - (3) 30 rem to the forearms.
 - (4) 75 rem to the hands or feet.
- f. Any internal uptake of radioactive material which on the basis of a small number of early assay data could result in a dose or dose commitment in excess of the pertinent annual standard set forth in the order DOE 5480.1, Chapter XI, "Standards for Radiation Protection," For whole-body dose, 5 rem is the pertinent annual standard. (Type B investigation.)
- g. Any vehicle transporting radioactive material that is known by the shipper or the receiver to have been found on arrival at a Department of Energy or Department of Energy contractor facility to be contaminated in either the interior or exterior above the limits specified in Section 173.397, "Contamination Control," Department of Transportation Regulations, 49 CFR 173. (Level of investigation shall be determined by the head of the field organization.)
- h. Any shipment of radioactive material that arrives at a Department of Energy contractor facility damaged to the extent that there is substantial reduction in the effectiveness of the package; from which radioactive contents are leaking or may have leaked; or contaminated above the limits specified in Section 173.397, "Contamination Control," Department of Transportation Regulations, 49 CFR 173. (Level of investigation shall be determined by the head of the field organization.)

3. INFORMATION REQUIRED IN NOTIFICATIONS MADE IMMEDIATELY OR WITHIN 72 HOURS.

- a. For immediate notifications, as soon as sufficient information is obtained to indicate the general nature and extent of the occurrence, the reporting official shall notify the Emergency Operations Center by telephone (301-353-5555 or FTS 233-5555). All calls on this emergency number are tape recorded. A confirming teletype shall be sent as soon as possible.
- b. For the immediate notification confirmation and the 72 hour notification, a teletype shall be directed to the the Director, Operational and Environmental Safety Division, with copies to the appropriate programmatic division director and to the Inspector General and the

Director, Office of Public Affairs. If possible, the teletype shall state:

- (1) Time, date, location, contractor, general nature of the occurrence, and its major consequences.
- (2) Whether a press release has been issued or is contemplated.
- (3) Whether known facts eliminate need for investigation by a Department of Energy board.
- (4) Known significant details of the occurrence, the consequences, programmatic and public effects, injuries, property damage, action taken for emergency control and amelioration, status of actions to initiate investigation, and comments on possible causes of occurrence.
- (5) If appropriate, the names and titles of proposed investigation board, advisors, and consultants.

c. The following information shall be obtained and filed on occurrences which take place during the transportation of radioactive materials:

- (1) Identification of the shipper and receiver.
- (2) Identification of service used for shipment, i.e., public vehicle or common carrier and mode of shipment (truck, rail, air, or waterway). Include the name of the carrier and the specific vehicle or car number.
- (3) Location of occurrence.
- (4) Driver's account or report of the occurrence.
- (5) Identification of the packaging by model, special permit, specification, or certificate number.
- (6) Type and quantity of material in each package, and total quantity in the shipment(s).
- (7) Nature of package and vehicle contamination, if any.
- (8) Radiation levels detected (direct) and amount of removable contaminants (microcuries per 100 square centimeters).

- (9) Personnel exposure and contamination, how determined, and action taken.
- (10) Extent of contamination and estimated cost of cleanup.
- (11) Nature of packaging failure, if any.
- (12) Source of contamination if the package is undamaged.
- (13) Nature of any defects or deterioration of the packaging.
- (14) Evidence of improper package handling.

1
DOE 5484.2

UNUSUAL OCCURRENCE REPORT

NAME OF LABORATORY SITE OR CONTRACTOR

Page ____ of ____

1. UOR Number _____
2. Status and Date: Initial _____
Interim _____
Final _____

3. Division or Project: _____

4. Facility, System,
or Equipment: _____

5. Date of
Occurrence: _____

6. Time of
Occurrence _____

7. Subject of Occurrence: _____

8. Apparent Cause: Design _____ Material _____ Personnel _____
Procedure _____ Other _____ (Explain in Item 14.)

9. Description of Occurrence: _____

10. Operating Conditions of Facility at Time of Occurrence: _____

11. Immediate Evaluation: _____

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UOR No. _____
UOR Date _____

12. Immediate Action Taken and Results:

13. Is Further Evaluation Required:

Yes _____ No _____

If Yes, Before Further Operation: Yes _____ No _____

If Yes, By Whom? _____

When? _____

14. Final Evaluation and Lessons Learned:

15. Corrective Action:

Taken: _____ Recommended: _____ To Be Supplied: _____

16. Programmatic Impact:

17. Impact Codes and Standards:

18. Similar Unusual Occurrence Report Numbers:

19. Signatures:

Originator _____ Date _____

Approved by _____ Date _____

Approved by _____ Date _____

Approved by _____ Date _____

INSTRUCTIONS FOR COMPLETING AN UNUSUAL OCCURRENCE REPORT

The following item numbers correspond with the numbers used on the sample UOR. Efforts concerning certain sensitive facilities of activities may contain classified information and shall be reviewed for classification where appropriate. Spacing of items in the form may be altered as necessary to provide adequate space for full exposition of items. When there is insufficient space for providing complete information on pages 1 and 2, add a supplemental page for additional information referencing back to the appropriate text item(s) number and title.

1. UOR Number. Assign an alphanumeric designation consisting of the acronym of the contractor/laboratory, the last two digits of the year in which the incident occurred, and a sequential report identification number. This number shall be followed by a facility designation consisting of the acronym of the facility in which the event occurred followed by either: (1) a sequential number; or (2) the last two digits of the year followed by a sequential number; e.g., EG&G 81-21-ATR 81-8. The number assigned to an initial UOR shall be used to identify subsequent interim and final UORs for the same occurrence.
2. Status and Date. Show all dates. Dates of initial and interim reports should be shown on all subsequent issues of the same UOR.
3. Division or Project. Identify in full the organizational unit responsible for the facility in which the occurrence took place and the cognizant PSO.
4. Facility, System, or Equipment. Identify the facility in which the occurrence took place, and the system or equipment item involved as applicable.

5. Date of Occurrence. Enter the date of the occurrence, if known; otherwise enter the date on which the occurrence was identified and so state.
6. Time of Occurrence. Enter the exact time of the occurrence, or the best approximate time if the exact time is not known. This may be important in the case where a sequence of events may have occurred, and thus provide some clue as to what might have happened.
7. Subject of Occurrence. Enter a brief title or description (20 words or less) that best details the nature of the occurrence.
8. Apparent Cause. Check the box that best describes the apparent cause. If more than one cause, check all that apply and identify the primary cause with a "P". If the box "Other" is checked, it is to be explained under item 14.
9. Description of Occurrence. Enter a clear, concise, objective description of what happened and what was observed including, when applicable, the mode of failure and the effect of the failure. Do not include in this item an evaluation of the occurrence or corrective actions taken. Include, as attachments, copies of photos, sketches, or drawings, when appropriate, for clarification.
10. Operating Conditions of Facility at Time of Occurrence. Describe the operational status of the facility or equipment at the time of failure, including pertinent temperatures, pressures, or other parameters necessary for evaluation of the occurrence and its consequences. If this information is not applicable, enter "Does not apply."
11. Immediate Evaluation. With the information available, provide a description of the immediate evaluation as to the cause of the unusual occurrence and its effect or possible effect on the plant, system, program, etc.
12. Immediate Action Taken and Results. Describe the immediate or remedial actions taken to return the facility, system, or equipment item to service, or to correct or alleviate the anomalous condition, and the results of those actions. These may be temporary measures to keep the facility in a safe standby condition or to permit continued operation of the facility without compromising safety until a more thorough investigation or permanent solution can be effected.

14. Final Evaluation and Lessons Learned. This item should be completed only in the final UOR. The final evaluation should include a discussion of cause, if appropriate, to supplement item 8, including an analysis of the root and contributing causes, and contributory factors disclosed by investigation. Include any lessons that others might learn from the occurrence that could be of importance to facility operators or that should be addressed in personnel training or facility procedures. Consequences of the occurrence and steps taken to alleviate those consequences should not be described unless they contribute to an understanding of the occurrence.
15. Corrective Action. Check the appropriate box and describe the action taken to prevent recurrence. Corrective action which is identical to the immediate action identified in item 12 need not be repeated; however, a reference to Item 12 should be entered. The UOR cannot be considered final until corrective action has been completed.
16. Programmatic Impact. Describe the impact on the program or project affected by the occurrence. This could be a loss of data, loss of plant availability for a specified period, additional costs, delay in schedule, or other measurable consequences of the occurrence.
17. Impact Upon Codes and Standards. If the unusual occurrence impacts upon the requirements of the national codes and standards, or program standards, the adequacy of the codes or standards to prevent recurrence should be stated.
18. Similar Unusual Occurrence Report Numbers.. Indicate any similar unusual occurrences for this facility or other facilities of which you are aware. Also enter any known commercial reactor License Event Report (LER) or other related documents that describes a similar occurrence. The purpose of this item is to identify, if recognized, occurrences that might suggest a generic problem.
19. Signatures. Each UOR must be signed by, as a minimum, the individual originating the report, the cognizant supervisor, and the responsible line manager. In addition to the written signatures, the typed names and titles of the signers shall be provided.

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Note:

Each page of the UOR shall be numbered (preferably at the top right) using the following format: Page ____ of ____.
The total number of pages is to include any continuation pages or extra attachments.